

Question	Scheme	Marks	AOs
3(a)	$\mathbf{v} = \frac{\mathrm{d}}{\mathrm{d}t}(\mathbf{r})$	M1	1.1b
	$\mathbf{v} = (3t^2 - 5)\mathbf{i} + (10t + 6)\mathbf{j}$	A1	1.1b
	Parallel to $(\mathbf{i} + 2\mathbf{j}) \Rightarrow (10T + 6) = 2(3T^2 - 5)$	M1	3.1a
	$6T^2 - 10T - 16 = 0$	A1	1.1b
	$T = \frac{8}{3}$	A1	2.2a
		(5)	
(b)	$\mathbf{a} = \frac{\mathrm{d}}{\mathrm{d}t}(\mathbf{v})$, $(\mathbf{a} = 6t\mathbf{i} + 10\mathbf{j})$	M1	1.1b
	$\mathbf{F} = 0.5(12\mathbf{i} + 10\mathbf{j})(= 6\mathbf{i} + 5\mathbf{j})$	M1	2.1
	$ \mathbf{F} = \sqrt{6^2 + 5^2}$	M1	1.1b
	$= \sqrt{61}(= 7.8(1....))$	A1	1.1b
		(4)	
(9 marks)			
Notes:			
(a)	M1	Differentiate – majority of powers going down, correct coefficient of t or t^2 .	
	A1	Any equivalent form	
	M1	Use ratio to form equation in T .	
	A1	Correct unsimplified expression in T . Any equivalent form	
	A1	Correct only. Allow 2.7 or better. If $T = -1$ is seen, it must be rejected.	
(b)	M1	Differentiate their \mathbf{v} to obtain \mathbf{a}	
	M1	Substitute $t = 2$ and use $\mathbf{F} = m\mathbf{a}$	
	M1	Use of Pythagoras to find modulus of \mathbf{F} or \mathbf{a}	
	A1	7.8 or better	